



Third Five-Year Review Report

for

Chemical Control Corporation Superfund Site

City of Elizabeth, Union County, New Jersey

May 2009

Prepared by:

United States Environmental Protection Agency

Region 2

New York, New York

Executive Summary

The Remedy for the Chemical Control Superfund Site in Elizabeth, New Jersey included the solidification of over 18,000 cubic yards of soils contaminated with a variety of metals and organic compounds. The trigger for this third Five-Year Review was the completion of the second Five-Year Review in January 2004.

The assessment of this third Five-Year Review found that the remedy was constructed in accordance with the requirements of the Record of Decision (ROD). The remedy is functioning as intended and is protective of human health and the environment in the short-term.

Five-Year Review Summary Form

SITE IDENTIFICATION

Site Name (from WasteLAN): Chemical Control Corporation

EPA ID (from WasteLAN): NJD000607481

Region: 2

State: NJ

City/County: Elizabeth/Union County

SITE STATUS

NPL Status: X Final ☐ Deleted ☐ Other (specify) _____

Remediation Status (choose all that apply): ☐ Under Construction ☐ Operating X Complete

Multiple OUs? ☐ YES X NO

Construction completion date: 06/30/1994

Has site been put into reuse? ☐ YES X NO ☐ N/A

REVIEW STATUS

Lead agency: X EPA ☐ State ☐ Tribe ☐ Other Federal Agency _____

Author name: Nigel Robinson

Author title: Remedial Project Manager

Author affiliation: EPA

Review period:** 01/06/2004 to 01/06/2009

Date(s) of site inspection: 11/14/2008

Type of review:

- ☐ Post-SARA ☐ Pre-SARA ☐ NPL-Removal only
☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead
☐ Regional Discretion X Statutory

Review number: ☐ 1 (first) ☐ 2 (second) X 3 (third) ☐ Other (specify) _____

Triggering action:

- ☐ Actual RA Onsite Construction at OU # _____ ☐ Actual RA Start at OU# 1: 9/30/1984
☐ Construction Completion X Previous Five-Year Review Report
☐ Other (specify) _____

Triggering action date (from WasteLAN): 01/06/2004

Due date (five years after triggering action date): 01/06/2009

Does the report include recommendation(s) and follow-up action(s)?

X yes ☐ no

Is the remedy protective of the environment? X yes ☐ no ☐ not yet determined

Five-Year Review Summary Form (continued)

Issues, Recommendations, and Follow-Up Actions

It is recommended that groundwater and surface water monitoring along with groundwater elevation measurements be resumed as a part of a revised monitoring plan for the site. It is also recommended that given the successful treatment of volatile organic compounds in the area of well CW-3 (outside of the solidified mass), using *in-situ* bioremediation, further *in-situ* treatment to address residual petroleum hydrocarbons be considered. To deter potential trespassers from entering the site, the chain-linked fence and the gate must be repaired. While not included in the remedy in the Record of Decision, institutional controls are recommended to maintain the long-term protectiveness of the remedy.

Other Comments on Operations, Maintenance, Monitoring, and Institutional Controls

Routine operation and maintenance activities will continue at the site; adjustments to these activities will be made as needed.

Protectiveness Statement

The assessment of this third Five-Year Review found that the remedy was constructed in accordance with the requirements of the Record of Decision. The remedy is functioning as intended and is protective of human health and the environment in the short-term.

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I. Introduction

This third Five-Year Review for the Chemical Control Corporation Site (Chemical Control), located in the City of Elizabeth, Union County, New Jersey (Figure 1), was conducted by EPA Remedial Project Manager (RPM) Nigel Robinson. The Five-Year Review was conducted pursuant to Section 121 (c) of the Comprehensive Environmental Response, Compensation, and Liability Act, as amended, 42 U.S.C. §9601 et seq. and 40 CFR 300.430(f)(4)(ii) and in accordance with the Comprehensive Five-Year Review Guidance, OSWER Directive 9355.7-03B-P (June 2001). The purpose of Five-Year Reviews is to ensure that implemented remedies protect public health and the environment and that they function as intended by the decision documents. This document will become part of the site file.

In accordance with the Section 1.5.3 of the Five-Year Review Guidance, a statutory Five-Year Review is triggered by the signature date of the previous Five-Year Review report. The trigger for this Five-Year Review was the second Five-Year Review Report, which was signed on January 6, 2004. Based upon a review of field data collected between 1998 and 2004, the 2004 Five-Year Review concluded that the remedy was protective. Activities performed as part of the Operation and Maintenance (O&M) of the remedy are discussed later in this document. This Five-Year Review evaluated those activities in addition to the new monitoring data collected since 2004.

II. Site Chronology

Table 1 (attached) summarizes the site-related events from discovery to the first Five-Year Review.

III. Background

Physical Characteristics

The Chemical Control property is located at 23 South Front Street. It is part of a narrow peninsula formed by the Elizabeth River and the Arthur Kill. This peninsula was a marsh until it was filled in to prepare it for industrial development in the 1800s. The Elizabeth River, the Arthur Kill, and the water table aquifer at the site are saline and tidally influenced. The site is flat and barely above sea level. The Chemical Control facility occupied approximately 2.2 acres.

Land and Resource Use

Land usage in the immediate site vicinity is industrial. The site is bordered on the south, across South Front Street, by the Loizeaux Ready-Mix facility, a concrete plant, on the east by a building owned by the Loizeaux Ready-Mix, on the north by the Elizabeth River, and on the west by a scrap metal yard.

Geology

The bedrock below the site is the Brunswick Formation, part of the Newark group of sediments deposited in the Newark Basin during the Triassic Period. The Newark Group consists of 16,000 to 20,000 feet of non-marine clastics, with some intrusive and extrusive basic igneous rocks. The Brunswick Formation is the thickest of the three formations comprising the Newark Group. In the Newark area this formation is estimated to be 6,000 feet thick.

In the vicinity of the site, the Brunswick Formation is characterized as fine-grained shale to siltstone. It has a characteristic red color.

The Brunswick Formation is overlain throughout most of Union County by Pleistocene glacial deposits from the Wisconsin glaciation. These glacial deposits are found in varying thickness, at some locations filling pre-glacial valleys with stratified outwash deposits. Unstratified glacial drift forms a mantle over the Brunswick throughout most of Union County.

At the shallowest depths below ground surface, a combination of glacial deposits and artificial fill are found in the vicinity of the site. Recent geologic depositional history is from overbank stream deposits formed after the glacial retreat. Mud and silts with inclusions or organic materials are common in the Newark area and along the Arthur Kill. Of particular note at the site is a clay layer found at between 14 and 18 feet below ground surface that serves as a barrier to flow between shallow and deeper groundwater. Over time, much of the low-lying coastal land was built up with artificial fill, including the area of the site; as much as nine feet of fill material have been measured at the site.

The mean depth to groundwater is approximately four to seven feet. Shallow groundwater shows tidal influence and is saline, consistent with a close interchange with surface water of the Elizabeth River and the Arthur Kill, both estuary waters of the

Atlantic Ocean. Due to the salinity of the groundwater, the groundwater is not considered a drinking water source.

History of Contamination

From 1970 to 1978, Chemical Control Corporation operated as a hazardous waste storage, treatment, and disposal facility, accepting various types of chemicals including: acids, arsenic, bases, cyanides, flammable solvents, polychlorinated biphenyls (PCBs), compressed gases, biological agents and pesticides. Throughout its operations, the Chemical Control Corporation was cited for discharge and waste storage violations. The facility operated until March 1979, when it was closed due to numerous environmental and safety violations by the New Jersey Department of Environmental Protection (NJDEP).

Initial Response

The State's initial cleanup of the site starting in March 1979 removed 55,400 pounds of bulk solids, 1,800 gallons of bulk liquids, nearly 10,000 drums of waste, 83 gas cylinders, 10 pounds of infectious wastes, seven pounds of radioactive wastes and 24 gallons of highly explosive liquids. While the emergency response action was still in its early stages, on April 21, 1980, an explosion and fire occurred at the site. The fire was not brought under control for more than ten hours. The explosion and fire destroyed buildings and other materials and reportedly launched drums of burning waste into the air.

NJDEP continued its (pre-Superfund) cleanup operation after the fire and removed all building debris, drums (found on and buried below the surface) and tanks from the site. Three feet of surface soil was also removed from the site and from the property across the street that had been used as a staging area during the cleanup. This soil was replaced with three feet of gravel. Unmarked gas cylinders pose unique disposal hazards, and cylinders discovered during the operation were stored at the site. In addition, NJDEP also operated a groundwater recovery and treatment system from November 1980 through July 1981.

In 1983, EPA signed a Record of Decision (ROD) that addressed the remaining response activities at the site as a result of the fire. These activities included:

- the testing, removal and disposal of 200 cylinders found at the site, the removal and disposal of drums, pails, gas cylinders and other materials found in the Elizabeth River;

- cleaning of sewers, catch basins and curbing; and
- the decontamination of trailers and a vacuum truck left at the site at the end of the emergency response actions.

This work was implemented by EPA in several phases, the last of which (the disposal of the gas cylinders) was completed in September 1990.

Basis for Taking Action

The Chemical Control site was proposed for inclusion to the National Priorities List (NPL) of Superfund sites in October 1981. The site became final on the NPL in September 1983. A remedial investigation and feasibility study (RI/FS) was conducted at the site from 1985 to 1986. The study determined that contaminants found in the soils, groundwater, surface water and sediments included, but were not limited to, the following:

acetone	2-butanone
vinyl chloride	benzene
toluene	ethylbenzene
chlorobenzene	trichloroethane
1,2-dichloroethene	PCBs
di-n-butyl phthalate	benzyl alcohol
benzoic acid	pyrene
naphthalene	fluorene

At the time of the RI/FS, the greatest potential risk from the site was the possible exposure to contaminated soils. Significant health threats were posed through direct contact, fugitive dust emission and volatilization. However, these risk factors were significantly reduced as the contaminated soils were below the water table and a layer of gravel; in addition, the site was fenced. The risk posed by the groundwater was minimal as it was saline and therefore not a drinking water source. Residents and businesses in the area are supplied with municipal water.

Very low levels of contamination were found in the surface water. Higher levels of contamination were found in the sediments, however, the data failed to show any trend linking the contaminants to the site. Such a linkage was difficult because of the other potential sources of contamination along the river. The river was lined with junk yards, oil tank farms, and chemical manufacturers, and storm water runoff from much of the city's

street carries oil and other contaminants into the river. Remediation of the river sediments was not included as a component of the site remedy as remediation of the soils would eliminate the source of contaminants emanating from site soils but not from the other potential sources.

IV. Remedial Actions

Remedy Selection

Based on the results of the RI/FS, EPA signed a second ROD for the site on September 23, 1987. The ROD called for:

- Treatment of 18,000 cubic yards of contaminated soil at the site using in-situ fixation;
- Removal of debris from earlier response actions, including drill cuttings, monitoring well development water, items recovered from the Elizabeth River under the initial remedial measures, used equipment and the decontamination pad;
- Sealing of the sanitary sewer line under the site where it connects to the South Front Street storm sewer.
- Repair of the berm that separates the site from the Elizabeth River; and
- Collection and analysis of environmental samples, as required, to ensure the effectiveness of the remedy.

Remedy Implementation

On October 23, 1990, the Primary Settling Defendants (PSDs) for the Chemical Control Corporation entered into a Consent Decree with EPA for the implementation of the remedy as selected by the ROD. Construction started at the site in August 1993 and was completed in April 1994.

The remedy consisted of the following components:

- Treatment of the contaminated soils at the site using in-situ fixation;
- Removal of debris remaining from earlier response actions, including drill cuttings, monitoring well development water, items recovered from the Elizabeth River under the initial

remedial measure, used disposal equipment, and the decontamination pad;

- Sealing of the sanitary sewer line under the site where it connects to the South Front Street storm sewer; and
- Collection and analysis of environmental samples, as required, to ensure the effectiveness of the remedy, including an evaluation after five years to assess its protectiveness to public health and the environment.

In addition to implementing the above components of the 1987 ROD, the PSDs incorporated a slurry wall into the remedy; the slurry wall was installed around the perimeter of the site. The purpose of the slurry wall was to further isolate and contain the solidified soils. The slurry wall was constructed around the perimeter of the site and anchored into a clay layer underlying the site. By anchoring the slurry wall into the clay layer, the surrounding groundwater was cut off from entering and leaving the site. A virgin mixture of concrete was added to the top of the solidified mass to provide a barrier between the exterior elements such as rainfall and the solidified soils. The top of the solidified mass was then designed to prevent water infiltration into the solidified mass and to maximize surface water runoff toward the Elizabeth River. The solidified mass was then covered with a layer of gravel. Finally, an 8-foot chain-link fence was installed around the site to restrict unauthorized access. The final inspection of the site was conducted on April 21, 1994 and the Remedial Action Report was finalized on September 30, 1994.

System Operations/Operation and Maintenance and Monitoring

The PSDs have been conducting long-term monitoring and maintenance activities in accordance to the operation and maintenance (O&M) plan, approved by EPA November 1992. The primary activities associated with the O&M plan are:

Visual inspection of the surface and solidified mass with regards to erosion, drainage and the security of the chain link fence;

- Hydraulic conductivity testing of the stored stabilized soil samples/cores;
- Groundwater and surface water sampling; and
- Groundwater elevation monitoring.

Site inspections were initially performed on a quarterly basis; then decreased to a bi-annual basis and eventually to an annual basis. As discussed later in this report, the PSDs undertook additional actions using *in-situ* bio-remediation to address residual contamination outside of the slurry wall, and as a consequence, groundwater and surface water sampling was suspended. In addition to assessing the existing sampling and field activities performed since the last review, this Five-Year Review considers to what degree groundwater and surface water sampling monitoring should resume.

V. Progress since the Last Review

Protectiveness Statement from the Last Five-Year Review

The second Five-Year Review for the site, which was completed in January 2004, concluded that the remedy for the site was protective of human health and the environment. The 2004 Five-Year Review concluded that the area of soils along the Elizabeth River that was previously untreated and was then being treated through *in-situ* remediation may pose a limited risk to human health and the environment, but there did not appear to be any exposure to human or environmental receptors from site contaminants and none was expected over the next five years. The review found the remedy protective of human health and the environment.

Status of Recommendations and Follow-up Actions

There were no recommendations or follow-up actions from the previous Five-Year Review.

Results of Implemented Action

The Hydrogen Release Compound (HRC) portion of the *in-situ* bioremediation achieved its goal of reducing concentrations of volatile organic compounds (VOCs) to non-detectable levels in the groundwater. The Oxygen Release Compound (ORC) application portion was not implemented (see data review below). With the exception of the *in-situ* remediation, there was no other implementation.

Status of Prior Issues

No prior issues existed.

VI. Five-Year Review Process

Administrative Components

Representative of the PSDs was informed by EPA of its intent to conduct the third Five-Year Review of the site. The Five-Year Review team consisted of Nigel Robinson (Remedial Project Manager), Michael Scorca (Hydrogeologist), Lora Smith (Risk Assessor), and Natalie Loney (Community Involvement Coordinator) of EPA.

Community Involvement

EPA notified the community of the initiation of the review process by publishing a notice in the Star-Ledger Newspaper in January 2009. The notice indicated that EPA would be conducting a Five-Year Review of the remedy at the Chemical Control site to ensure that the remedy remains protective of public health and is functioning as designed. It was also indicated that, once the Five-Year Review was completed, the results would be made available in the local site repositories. In addition, the notice included the RPM and the Community Involvement Coordinator's business addresses, email addresses and telephone numbers for questions related to the Five-Year Review process for the Chemical Control site.

The RPM has not been notified of any additional concerns with the remedy that were not already under consideration in this review.

Document Review

The documents, data, and information that were reviewed in completing the Five-Year Review are found in Table 4.

Data Review

The data reviewed included the data from the first and second Five-Year Reviews, results from the *in-situ* bioremediation application, and subsequent monitoring data through 2008.

As described in the 1992 O&M plan, monitoring of the remedy included surface water sampling, the testing of sample cores from the solidified mass, and groundwater monitoring.

Surface Water Sampling

Sampling during the RI/FS did not identify surface water or sediment contamination directly attributable to the site, though the general surface water and sediment conditions were degraded as a result of multiple sources. Surface water sampling was included in the O&M plan as an additional source of information for evaluating the performance of the remedy. Surface water samples were collected either quarterly, semi-annually or annually through 2002, when site monitoring was suspended for reasons discussed below and then again in 2008. None of the earlier (pre-2002) sampling suggested site-related effects on the river that differed from the data considered in the 1987 ROD.

As a part of an August 2008 sampling effort, two surface water samples, SW-1 and SW-2, were collected and analyzed (see Figure 3). Neither of the two indicator chemicals, vinyl chloride or 2-butanone, was detected. Acetone and a low concentration of chloromethane were detected. Acetone is not thought to be site-related; it is a common laboratory chemical and is frequently detected in environmental samples. Chloromethane has not been detected in any groundwater samples and, therefore, its source is not site-related. None of the other VOCs that were detected in the groundwater were detected in the surface water samples (see Table 6).

Solidified Mass Testing

During implementation of the chemical fixation remedy, core samples were collected of the solidified mass. The core samples, which are stored at a secure location away from the site, allow the permeability of the solidified soils to be tested without compromising the integrity of the site through new drilling or cutting. The result of this testing program is extrapolated to assess the performance of the solidified mass. In accordance with the O&M plan, one solidified soil core sample is tested per year to determine its permeability. Table 3 lists the solidified core permeability test results. The 2007 results indicate a hydraulic conductivity of 7.7×10^{-8} centimeters per second (cm/sec). The overall permeability of the samples has decreased over time and has reached permeability values in the range of 1 to 2×10^{-9} cm/sec. This range exceeds the performance standard established in the Statement of Work, via the 1987 ROD, of 1.5×10^{-5} cm/sec and the RCRA composite landfill cap standard of 1×10^{-7} cm/sec.

Groundwater Sampling and Additional *In-situ* Bioremediation Activities

Among the monitoring methods identified in the O&M plan, groundwater sampling was thought to be the best technique for evaluating the effectiveness of the remedy, by monitoring the groundwater immediately adjacent to the solidified mass. In defining a monitoring mechanism to measure the effectiveness of the remedy through groundwater monitoring, a net decrease method was selected, with the aim of determining whether there was a net decrease in the concentration of contaminants emanating from the solidified mass over time. The net difference was to be ascertained by comparing the post-remediation mean concentrations of a given contaminant in a given monitoring well with the pre-remediation mean concentration in that well. Thus, the performance goal was to achieve a significant net decrease between the post-remediation and the pre-remediation mean concentration for each compound.

Vinyl chloride and 2-butanone were selected as the indicator compounds, and three monitoring wells (CW-3, CW-4 and CW-5) situated between the Elizabeth River and the solidified slurry wall (see Figure 2), were sampled for these compounds in accordance with the 1992 O&M plan. These three wells are screened in the shallow aquifer at depths of between 11.5 and 12.5 feet below ground surface, and if contaminants were to leach from the solidified mass into the groundwater, the contaminants would be detected in these wells. In 1998, at the time of the first Five-Year Review, statistical analysis was performed on the data, which suggested that a significant statistical reduction occurred between the pre-and post-remediation. This reduction occurred around the time that the soils were solidified in 1993. The indicator parameters were generally below the detection limits in wells CW-4 and CW-5; however, during the time from completion of the remedy to the time of the first Five-Year Review (1993 to 1998), there was very little further reduction in the vinyl chloride and 2-butanone concentrations in well CW-3. Moreover, absolute concentrations of the indicator parameters remained relatively high in well CW-3. Based on the data, EPA made the determination that it was not evident that the remedy was protective of human health and the environment and that EPA would take action to verify the protectiveness of the remedy and, if necessary, take actions to make the remedy protective. In addition, a question was raised as to whether these groundwater monitoring wells were the appropriate way of monitoring the effectiveness of the remedy.

Following the first Five-Year Review, several theories were suggested for the contamination found in CW-3. It was suggested that the contamination resulted from one or more of the following: (1) leakage from the solidified mass; (2) a continuing source from the adjacent property (not attributable to the NPL Site); or (3) a result of residual contamination in a small area of untreated soils between the slurry wall and the Elizabeth River. The PSDs evaluated the alternatives and suggested that the third (residual contamination) was the likely cause. During remedy implementation, the slurry wall was installed as close to the river as technically feasible, which left an area between the slurry wall and the river approximately 15 feet wide that slopes rather sharply down to the river's edge. The monitoring wells were installed in this thin strip of land. Additional soil sampling in this fringe of untreated soils did indeed indentify the indicator compounds in these untreated soils.

Beginning in 2002, the PSDs implemented an *in-situ* bioremediation treatment program for both the soils and groundwater in this fringe area, to reduce or eliminate the contamination in the vicinity of CW-3. The regular monitoring program was suspended prior to the implementation of the *in-situ* bioremediation remediation.

The *in-situ* treatment was initiated in November 2002 and phased in over a period of 21 months. Two separate phases, an anaerobic treatment of chlorinated hydrocarbons, followed by an aerobic treatment of petroleum hydrocarbons was initially discussed. The first phase involved the application of Hydrogen Release Compounds (HRCs) that stimulate and promote anaerobic *in-situ* bioremediation of chlorinated hydrocarbons in the saturated soils. Soil and groundwater sampling were performed to monitor the effectiveness of the HRC treatment.

A second phase of remedial activities was to consist of the application of Oxygen Release Compounds (ORCs) that would promote aerobic *in-situ* bioremediation of petroleum hydrocarbons (i.e., benzene, toluene, ethylbenzene, and xylenes, the "BTEX" compounds that constitute the priority pollutants in petroleum). After completion of the HRC treatment in 2004, the ORC portion of the application was not implemented because, at the time, sampling indicated that conditions at site did not appear to warrant it.

After the initial HRC application in November 2002, groundwater quality was analyzed to monitor HRC dissolution into saturated soil and anaerobic conditions promoted by the HRCs. Groundwater data showed that, after one year, the HRCs in the groundwater had

completely dissolved, as expected. Groundwater analyses also showed that by November 2003, the indicator parameters vinyl chloride and 2-butanone along with other volatile organic compounds had declined to non-detectable levels. Overall, the HRC application was effective at removing dissolved concentrations of chlorinated VOCs in the groundwater.

For soils, the average concentrations of some VOCs decreased as a result of the HRC treatment; however, moderate to low levels of residual chlorinated VOCs remained. The soil results suggested that the HRC process was somewhat effective at treating the source of chlorinated VOCs, but VOCs bound to fine-grained and organic-rich soils were not readily accessible for bacterial biodegradation.

Much of these data were available by the time EPA performed its second Five-Year Review of the site in 2004. EPA concluded that VOCs found in CW-3 were the result of residual soil contamination in the fringe area, and the solidified mass/slurry wall was performing as intended.

Groundwater samples were analyzed again in August 2008: all three monitoring wells, CW-3, CW-4 and CW-5, were sampled and analyzed and showed no presence of vinyl chloride or 2-butanone (Figure 3 and Table 5). These results, collected several years after the HRC treatment, suggest that any residual VOCs in the fringe area soil matrix are not readily released into the groundwater. No other chlorinated VOCs were detected in monitoring wells CW-3 and CW-5. Low concentration of 1,1-dichloroethane 2.1 micrograms per liter (ug/l) was detected in CW-4. Acetone, which is considered to be laboratory-derived and not site-related, was found in all three monitoring wells. The absence of VOCs particularly in CW-3, the well with the highest levels of VOCs prior to the HRC application, demonstrated that the HRC applications had been successful in treating VOCs in groundwater.

The compounds benzene, toluene, ethylbenzene and benzene (BTEX), when found together are an indicator of petroleum contamination. Concentrations of BTEX compounds have shown a decline, but not to the extent shown by chlorinated VOCs. Benzene in particular remained high and was detected as high as 190 ug/l. The New Jersey Class IIA Groundwater Quality Standard for benzene is 1 ug/l, (See Table 5). Given the BTEX signature found in the soil, it is not clear that the benzene is site-related.

Site Inspection

A site inspection for this Five-Year Review was conducted on November 14, 2008, by Nigel Robinson, remedial project manager, Michael Scorca, hydrogeologist, and Lora Smith, risk assessor. The site was inspected for general conditions, drainage, debris and access controls. The site was found to be in good condition. The fence surrounding the site remains intact; there are no visible signs of trespassing onto the site, though trespassers can easily access the site through a large gap under the fence adjacent to the gate located along the bank of the Elizabeth River. Trespassers can also enter the site through this gate, which also has a gap, as it does not close completely. Residential debris such as empty glass bottles, aluminum cans and small amount of miscellaneous trash were found close to the fence line on several sides of the site. The top surface of the solidified mass, which includes a layer of clean concrete topped with gravel, is constructed with a gradient that allows for maximum rainfall runoff from its surface to the Elizabeth River and to the sewer/drainage system along South Front Street; the drainage continues to function as designed. There is no visible erosion of the solidified mass or the riprap stone along the bank of the Elizabeth River. Low-lying weeds with shallow rooting systems are found throughout the gravel cover at the site. The weeds do not pose any threat to the integrity of solidified mass. Wetland vegetation can be found along the bank of the Elizabeth River; this vegetation is similar to others found near the river and within the vicinity of the site.

Interviews

Site remedies were discussed with the State program representatives and PSDs' representatives and no issues were identified. There were no interviews with local government officials or community representatives.

Institutional Controls Verification

The 1987 ROD, the final ROD for the site, made no mention of institutional controls that may be appropriate to assure the protectiveness of the remedy. EPA's experience at other sites since that time has led to an expectation that two types of institutional controls are appropriate for the Chemical Control site:

- A Classification Exception Area (CEA) for groundwater, a

method of identifying areas of groundwater contamination under New Jersey State statute, and assure that CEA-designated areas are not used in such a way that would result in exposure to the contaminants.

- A deed notice, a land use control also devised by New Jersey State statute, that would, for this site, assure that future use of the site would not disturb the protectiveness of the implemented remedy.

In the case of the CEA, while the likelihood of groundwater use is minor, the PSDs provided information for the CEA to NJDEP in 2008, and NJDEP is currently evaluating the adequacy of that information. After review, NJDEP will either establish a CEA that covers the site area groundwater or require additional information prior to implementing the CEA. This implementation is still pending. The site has not affected the underlining aquifer and the implemented remedy physically goes from the ground level to the top of the clay layer, so the solidified mass and slurry wall displaces all the shallow groundwater on the site proper, and given the urban setting for the site, monitoring wells placed outside the site are immediately subject to other potential sources.

With regard to the deed notice, the current owner of the property is still the long-defunct Chemical Control Corporation. The PSDs have no real estate interest in the site.) Reuse of the property would only happen after some action on the part of the City of Elizabeth, such as a foreclosure of the property for unpaid property tax liabilities or by a new entity somehow obtaining the property. In most cases, deed notices are placed on a property by the property owner under the direction of a regulatory agency, in this case, EPA. EPA and the PSDs are still considering methods for placing a deed notice on the property in the absence of a viable land owner.

VII. Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

Yes, *in-situ* fixation of contaminated soils seems to have eliminated the direct contact pathway on the majority of the property. Soils along the Elizabeth River remain contaminated with BTEX compounds, and while these soils are not solidified, they are inaccessible to direct contact because of the rip-rap stone placed on the river's edge.

The ROD remedy required environmental monitoring to assess the protectiveness of the remedy. The 1992 O&M plan identified groundwater and surface water monitoring as the best methods for assessing the performance of the solidified mass, the primary remedial feature at the site. Groundwater monitoring at the site was suspended in 2002. In December 2004, the report *Operation and Maintenance and Post-Remediation Sampling Report with the Focused Remedial Assessment of Soil at CW-3* made several conclusions about the effectiveness of the original groundwater monitoring approach. Particularly, the report concluded that the groundwater flux was very low through the area, and little groundwater movement through the area meant that each well only provided information about a very localized area. Because each individual well represented such a small area of the perimeter, too many monitoring wells would be needed to identify, for instance, a localized failure of the slurry wall.

As the PSDs have demonstrated with the HRC applications along the Elizabeth River fringe area, the results of groundwater sampling alone are not a reliable indicator of remedy failure. Even so, a form of groundwater monitoring should be re-instated to provide an additional data resource to measure the effectiveness of the remedy. Periodic groundwater monitoring will monitor the solidified mass in addition to the remaining groundwater contamination along the Elizabeth River. Additional wells may be considered along the site perimeter, as it was indicated that no true gradient exists in the groundwater. In addition, a right-of-way extends 20 feet from the curb onto the site, and as a result, the solidified mass does not extend to the fence-line along South Front Street; rather, all soils in that area were excavated and replaced with clean material. Groundwater and soil samples collected from this portion of the site may be a better measurement of the condition of the solidified mass than CW-3, CW-4 or CW-5, simply because this area was fully remediated at the time. Further evaluation of the monitoring network is requires before any new wells can be installed.

With regard to the residual BTEX contamination, aerobic bioremediation (e.g., ORC) was initially considered for treating petroleum hydrocarbons in the fringe area, but it was not implemented because conditions did not appear to be present to support it. Aerobic *in-situ* treatment is an evolving field, and it is worth reconsidering the applicability of ORC for these soils.

Potential direct exposure to contaminated groundwater is not likely a concern as surrounding businesses and residences receive water from public water supplies. Direct exposure to groundwater

by construction/utility workers is unlikely given the presence of the solidified mass and the unlikelihood that work would be performed along the River, outside of the slurry wall.

NJDEP remains in the process of implementing a CEA at the site to restrict future groundwater use, but until such a control is implemented, it must be assumed that site groundwater may be used for potable purposes. While groundwater monitoring has shown the water to be saline and not suitable for drinking water, the default assumption for all the groundwaters of the state of New Jersey is that they are potable.

In addition, a deed notice is appropriate for the site prior to reuse of the property, to protect the implemented remedy from disturbance that could compromise its integrity (such as drilling into the solidified mass). EPA and the PSDs are still exploring ways of placing a deed notice on the site in the absence of a viable owner.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy still valid?

Yes, there have been no physical changes to the site that would affect the protectiveness of the remedy since the last review. Currently, the property is zoned as industrial/commercial use and it is expected to remain as such.

Soil and groundwater use are not expected to change during the next five years, the period of time considered in this review. Land use assumptions, exposure assumptions and pathways, and remedial action objectives considered in the decision documents remain valid. Although specific parameters may have changed since the time the risk assessment was completed, the process that was used is consistent with current practice and the need to implement a remedial action remains valid.

Soil vapor intrusion (SVI) is evaluated when soils and/or groundwater are known or suspected to contain VOCs. Several VOCs, primarily benzene, located in groundwater in the small fringe area outside the slurry wall continue to exceed their respective vapor intrusion screening criteria at the most protective values (cancer risk: 1×10^{-6}) identified in the draft *Evaluating the Vapor Intrusion into Indoor Air* guidance document (USEPA 2002). However, since this portion of the site is not stable enough to be excavated, it is unlikely that a building would be constructed on the bank of the Elizabeth River. There are currently no buildings located on the remainder of the

property. There is no evidence of volatile contaminants escaping the solidified mass. Therefore, vapor intrusion is not likely a future exposure pathway at the site.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

During the site visit, large openings were observed in perimeter fencing along the ground surface and the gate near CW-4 could not be closed due to a tree trunk. These site components, while minor, were included in the site remedy to further protect the public and did not appear to be functioning as intended. Debris and other evidence of trespassing indicate that it is necessary to keep the fencing intact as a deterrent. Trespassing on the solidified mass is not expected to result in unacceptable exposure. Fencing is for general site security and to prevent illegal dumping on the vacant property.

Also during the site visit, vegetation was observed to be growing on and around the solidified mass. While not a concern at this time, it should continue to be monitored and removed, as per current protocol.

Technical Assessment Summary

Site contaminants are contained in a solidified mass at the site which is intact and in good condition.

- A slurry wall around the solidified mass appears to be intact and the site drainage system is in good condition.
- The fence around the site is in reasonably good condition though some minor repairs are needed.
- Appropriate institutional controls have been identified for the site but are not currently in place.
- Even though trespassers can gain easy access to the site, there is no evidence of trespassing, vandalized damage to the site remedy or to the monitoring wells.
- There are no drinking water wells or withdrawals of water from drinking purposes in this area.
- The in-situ bioremediation treatment performed in the vicinity of monitoring well CW-3 has been successful in treating the VOCs in the groundwater; however, BTEX compounds

are still present in the groundwater.

VIII. Recommendations and Follow-Up Actions

Table - Recommendations and Follow-Up Actions

Issues	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
					Current	Future
No ground-water or surface water monitoring is occurring	(1) Resume groundwater monitoring (2) Re-evaluate existing monitoring well network	EPA/PSDs	EPA	10/01/2009	N	N
Fence around site does not prevent access	Repair fence	PSDs	EPA	07/01/2009	N	N
Institutional controls not in place	Implement ICs- such as deed notice	EPA/State/ PSDs	EPA/State	10/01/2014	N	Y

Since this is an abandoned property and there is no owner, EPA and the PSDs are still exploring how to implement a deed notice.

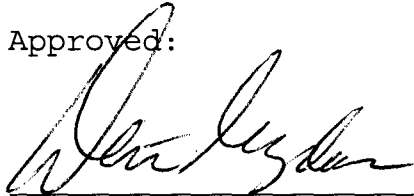
IX. Protectiveness Statement

Based on document and data review, the remedial actions currently protect human health and the environment in the short-term. In order to be protective in the long-term, institutional controls need to be implemented and residual BTEX contamination in soils needs to be addressed.

X. Next Review

Since hazardous substances, pollutants or contaminants remain at the Chemical Control site above levels which would allow for unlimited use or unrestricted exposure, EPA will conduct another Five-Year Review by or before May 2014.

Approved:



Walter Mugdan, Director
Emergency and Remedial Response Division

5/20/2009
Date

TABLES

Table 1: Chronology of Site Events

Events	Date
Hazardous waste disposal site	1970-1979
NJDEP initiated interim corrective measures	1979
An extensive fire destroyed the Site	1980
State operated groundwater recovery and treatment system	1980-1981
Preliminary cleanup completed by NJDEP	1981
Early Action Record of Decision (ROD) signed by EPA	1983
Final Listing on the National Priorities List	1983
EPA Initiated Interim Measures (required by 1983 ROD)	1985-1986
Remedial Investigation/Feasibility Study (RI/FS) conducted	1985 - 1987
EPA issued a Final Record of Decision (ROD)	1987
Final Listing on the National Priorities List	1983
EPA Initiated Interim Measures (required by 1983 ROD)	1985-1986
Remedial Investigation/Feasibility Study (RI/FS) conducted	1985 - 1987
EPA issued a Final Record of Decision (ROD)	1987
EPA Completed Cylinder Disposal (from 1983 ROD)	1989-1990

EPA and Settling Defendants entered into CD to conduct RD/RA	1991
Settling Defendants submitted Draft Design Report to EPA	1991
EPA approved Design Report	1992
Construction of remedy began	1993
Completion of construction activities	1993
EPA completed first Five-Year Review	1998
EPA completed second Five-Year Review	2004

Table 2: Annual System O&M Costs

Dates	Total costs rounded to nearest \$1,000
1999	\$43,668
2000	\$29,514
2001	\$19,823
2002	\$50,030
2003	\$28,756
2004	\$30,841
2005	\$22,636
2006	\$32,754
2007	\$24,460
2008	\$31,925

Table 3: Solidified Core Permeability Results

Test Date Qtr.	Year	Hydraulic Conductivity Test Results (cm/sec)
3Q	1994	9.6×10^{-8}
4Q	1995	7.5×10^{-8}
4Q	1996	2.8×10^{-8}
4Q	1997	7.3×10^{-8}
---	1998	-----
1Q	1999	1.5×10^{-8}
1Q	2000	2.7×10^{-8}
---	2001	-----
2Q	2002	4.0×10^{-9}
3Q	2003	4.1×10^{-9}
4Q	2004	1.6×10^{-9}
4Q	2005	1.65×10^{-7}
4Q	2006	1.31×10^{-9}
4Q	2007	7.76×10^{-8}

Table 4: List of Document Reviewed

- Operation and Maintenance/Post Remediation Monitoring Report, Chemical Control Corporation Site, Elizabeth, New Jersey – October 2008
- Operation and Maintenance and Post-Remediation Sampling Report with the Focused Remedial Assessment of Soil at CW-3 – December 2004
- Second Five-Year Review Report for the Chemical Control Superfund Site – January 2004
- Five-Year Review Report for the Chemical Control Superfund Site - September 1998
- Record of Decision for the Chemical Control Superfund Site - September 1983
- Record of Decision for the Chemical Control Superfund Site - September 1987
- Consent Decree for the Chemical Control Superfund Site - August 1990
- Operation and Maintenance Manual - August 1993
- Operations and Maintenance/Post Remediation Monitoring Plan - 1999-2001
- Letter from Chemical Control Group through John P. McBurney on Review of the O&M Program - June 2000
- Focused Remedial Assessment for CW-3 Soils - April 2002
- Operation and Maintenance and Post-Remediation Sampling Report - October 2002
- Remedial Action Report - December 15, 1986
- Remedial Action Report - February 20, 1990
- Remedial Action Report - September 30, 1994

Table 5
Ground Water Sample Results
Chemical Control Corp. Site

Sample ID	CW-3	CW-4	CW-5	FB	TB
Lab Sample Number	943282	943281	943280	943283	943284
Sampling Date	08/15/08	08/15/08	08/15/08	08/15/08	08/15/08
VOLATILE COMPOUNDS (ug/L)					
Chloromethane	0.9 U	2.2 U	0.4 U	0.4 U	0.4 U
Bromomethane	0.9 U	2.2 U	0.4 U	0.4 U	0.4 U
VinylChloride	0.5 U	1.2 U	0.2 U	0.2 U	0.2 U
Chloroethane	0.9 U	4.4	0.4 U	0.4 U	0.4 U
MethyleneChloride	0.8 U	2.0 U	0.4 U	0.4 U	0.4 U
Acetone	12	19	6.7	1.5 U	1.5 U
CarbonDisulfide	0.9 U	2.2 U	0.4 U	0.4 U	0.4 U
1,1-Dichloroethene	0.9 U	2.3 U	0.5 U	0.5 U	0.5 U
1,1-Dichloroethane	0.5 U	2.1	0.3 U	0.3 U	0.3 U
trans-1,2-Dichloroethene	0.8 U	2.0 U	0.4 U	0.4 U	0.4 U
cis-1,2-Dichloroethene	0.6 U	1.4 U	0.3 U	0.3 U	0.3 U
Chloroform	0.4 U	1.0 U	0.2 U	0.2 U	0.2 U
1,2-Dichloroethane	0.5 U	1.4 U	0.3 U	0.3 U	0.3 U
2-Butanone	2.6 U	6.4 U	1.3 U	1.3 U	1.3 U
1,1,1-Trichloroethane	0.8 U	1.9 U	0.4 U	0.4 U	0.4 U
CarbonTetrachloride	0.7 U	1.7 U	0.3 U	0.3 U	0.3 U
Bromodichloromethane	0.5 U	1.2 U	0.2 U	0.2 U	0.2 U
1,2-Dichloropropane	1.0 U	2.4 U	0.5 U	0.5 U	0.5 U
cis-1,3-Dichloropropene	0.3 U	0.6 U	0.1 U	0.1 U	0.1 U
Trichloroethene	0.7 U	1.8 U	0.4 U	0.4 U	0.4 U
Dibromochloromethane	0.5 U	1.4 U	0.3 U	0.3 U	0.3 U
1,1,2-Trichloroethane	0.4 U	1.1 U	0.2 U	0.2 U	0.2 U
Benzene	190	130	1.4	0.2 U	0.2 U
trans-1,3-Dichloropropene	0.3 U	0.8 U	0.2 U	0.2 U	0.2 U
Bromoform	0.4 U	1.0 U	0.2 U	0.2 U	0.2 U
4-Methyl-2-Pentanone	1.5 U	3.6 U	0.7 U	0.7 U	0.7 U
2-Hexanone	1.4 U	3.5 U	0.7 U	0.7 U	0.7 U
Tetrachloroethene	0.8 U	2.1 U	0.4 U	0.4 U	0.4 U
1,1,2,2-Tetrachloroethane	0.7 U	1.8 U	0.4 U	0.4 U	0.4 U
Toluene	1.6	15	0.3 U	0.3 U	0.3 U
Chlorobenzene	19	16	0.2 U	0.2 U	0.2 U
Ethylbenzene	3.3	38	0.4 U	0.4 U	0.4 U
Styrene	0.8 U	2.0 U	0.4 U	0.4 U	0.4 U
Xylene(Total)	15	250	0.4 U	0.4 U	0.4 U

U - The compound was not detected at the indicated concentration.

TB = Trip Blank

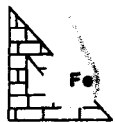
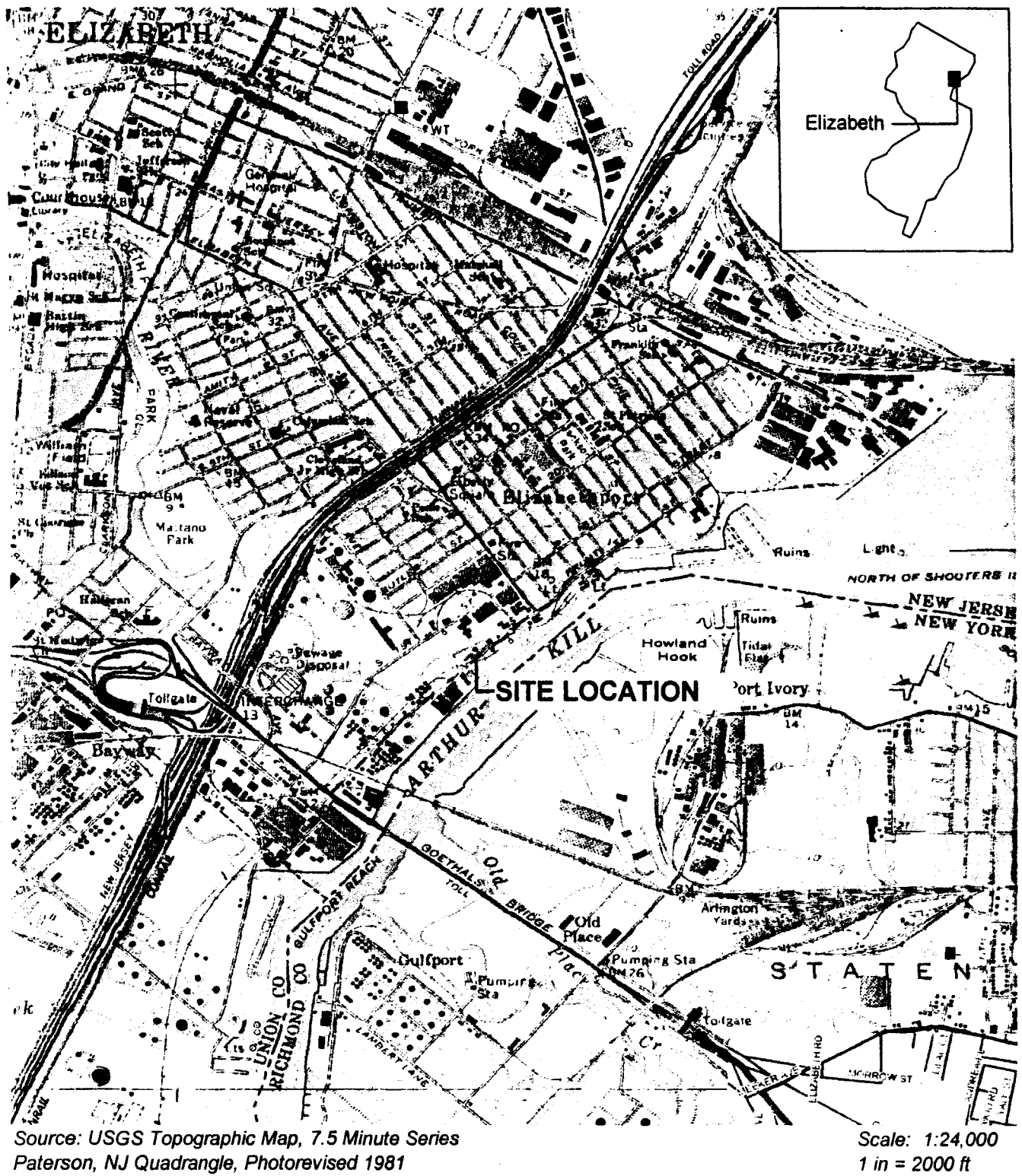
FB = Field Blank

Table 6
Surface Water Sample Results
Chemical Control Corp. Site

Sample ID	SW-1	SW-2
Lab Sample Number	943278	943279
Sampling Date	08/15/08	08/15/08
VOLATILE COMPOUNDS (ug/L)		
Chloromethane	0.4 U	0.6
Bromomethane	0.4 U	0.4 U
VinylChloride	0.2 U	0.2 U
Chloroethane	0.4 U	0.4 U
MethyleneChloride	0.4 U	0.4 U
Acetone	4.3	4.4
CarbonDisulfide	0.4 U	0.4 U
1,1-Dichloroethene	0.5 U	0.5 U
1,1-Dichloroethane	0.3 U	0.3 U
trans-1,2-Dichloroethene	0.4 U	0.4 U
cis-1,2-Dichloroethene	0.3 U	0.3 U
Chloroform	0.2 U	0.2 U
1,2-Dichloroethane	0.3 U	0.3 U
2-Butanone	1.3 U	1.3 U
1,1,1-Trichloroethane	0.4 U	0.4 U
CarbonTetrachloride	0.3 U	0.3 U
Bromodichloromethane	0.2 U	0.2 U
1,2-Dichloropropane	0.5 U	0.5 U
cis-1,3-Dichloropropene	0.1 U	0.1 U
Trichloroethene	0.4 U	0.4 U
Dibromochloromethane	0.3 U	0.3 U
1,1,2-Trichloroethane	0.2 U	0.2 U
Benzene	0.2 U	0.2 U
trans-1,3-Dichloropropene	0.2 U	0.2 U
Bromoform	0.2 U	0.2 U
4-Methyl-2-Pentanone	0.7 U	0.7 U
2-Hexanone	0.7 U	0.7 U
Tetrachloroethene	0.4 U	0.4 U
1,1,2,2-Tetrachloroethane	0.4 U	0.4 U
Toluene	0.3 U	0.3 U
Chlorobenzene	0.2 U	0.2 U
Ethylbenzene	0.4 U	0.4 U
Styrene	0.4 U	0.4 U
Xylene(Total)	0.4 U	0.4 U

U - The compound was not detected at the indicated concentration.

Attachments



Frey Engineering

Figure 1
SITE LOCATION MAP

Chemical Control Corporation Site
Elizabeth, New Jersey

